

for major surgery in most instances, and is a procedure which should be thoroughly understood by any surgeon who is called upon to treat fractures. Doctor Breslin does not hesitate to advise open reduction when indicated, but the indications should definitely be those which have signified the failure of conservative measures. The percentage will be extremely low.

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STEELE F. STEWART, M. D. (3780 Wilshire Boulevard, Los Angeles).—Doctor Breslin has furnished us with an excellent reason for the satisfactory treatment of fractures.

We are pleased to note his commendation of the Mathews piano-wire form of skeletal traction which, so far as we know, is the most satisfactory method of applying skeletal traction, being much less damaging to apply than either the Steinman pin or the ice-tong type of traction; because of its small size, it can be easily applied to very much smaller points. We feel that traction is most desirable in practically all types of fractures, making use of the natural splinting action of the attached periosteum and surrounding muscles. The Mathews system has a further advantage of being applicable to parts where there has been considerable damage to the soft tissues.

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DOCTOR BRESLIN (Closing).—I wish to thank Doctors Jones, Linde, and Stewart for their discussions. It is true that an anteroposterior view of the hip will not reveal a lateral angulation of the neck of the femur, or show the cause of our failure to secure an accurate apposition of the fractured fragments. Doctor Davis, the roentgenologist for St. Vincent's Hospital, has adopted the Johnson technique as a routine measure in the roentgenologic study of all fractures of the femoral neck. What we have attempted to do in the treatment of all fractures is to obtain good functional results with a minimum of risk, particularly as to life. We have therefore made a serious effort to keep our open reductions at the lowest possible level.

THE LIVER IN CHRONIC HUMAN AMEBIASIS—ITS RELATIVE SIZE

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DISCUSSION by Alfred C. Reed, M. D., San Francisco;
John V. Barrow, M. D., Los Angeles; Rawson J. Pickard,
M. D., San Diego.

IN 1925 the presence of both motile and encysted forms of *Entameba histolytica* in the duodenal area was reported.¹ This finding again emphasized the importance in chronic amebiasis not only of the duodenal area, but of the whole liver area as well, and raised the question whether liver size might or might not have relative importance in helping to delineate the symptoms and signs of chronic human amebiasis as seen in California. To this end we began to record liver measurements. The data have been accumulating for the past eight years and are now for the first time assembled and digested by graph.

METHOD OF MENSURATION

In choosing the method of mensuration the author's effort was to secure one as simple and direct as possible, using percussion and palpation in the right midclavicular line.

Actually in our own work the sequence of events leading to this type of mensuration was:



Fig. 1.—Illustrates the occasional impossibility of ascertaining the size of the liver by roentgenogram. The individual of whom this roentgenogram was made had a liver containing a large abscess in the right lobe, this lobe extending well below the level of the umbilicus. The liver was described by the roentgenologist as "normal in size."

first, apparent increase in positive findings of *Entameba histolytica* in the feces when bile or bile salts had been administered by mouth previous to examination of fecal smears; second, demonstration of both motile and encysted *Entameba histolytica* in the duodenal area in material obtained by duodenal tube; third, failure of a highly competent roentgenologist to recognize the great increase in size of the right lobe of the liver caused by amebiasis accompanied by liver abscess.

An illustration of the inadequacy of roentgen-ray examination as a means of determining liver size is found in the accompanying reproduction of a roentgen-ray film made in 1925. As is evidenced by the notations in script on the film, the examiner found considerable difficulty in orienting himself as to right and left. The pertinent part of the conclusion by this examiner was that "the liver shadow is not large." Yet at the time that roentgenogram was made the liver was a large mass, firm in consistency, painful on pressure, containing in the right lobe a large abscess fully 15 centimeters in diameter. The lower edge of the right lobe extended to a level at least two fingerbreadths below that of the umbilicus, and was easily palpable. The roentgenologist's difficulty suggests that since roentgen-ray examination can only lead to a record of physical density, the values obtained by it will always be limited by discernible contrast. In the event of lack of contrast there can be no mensuration.

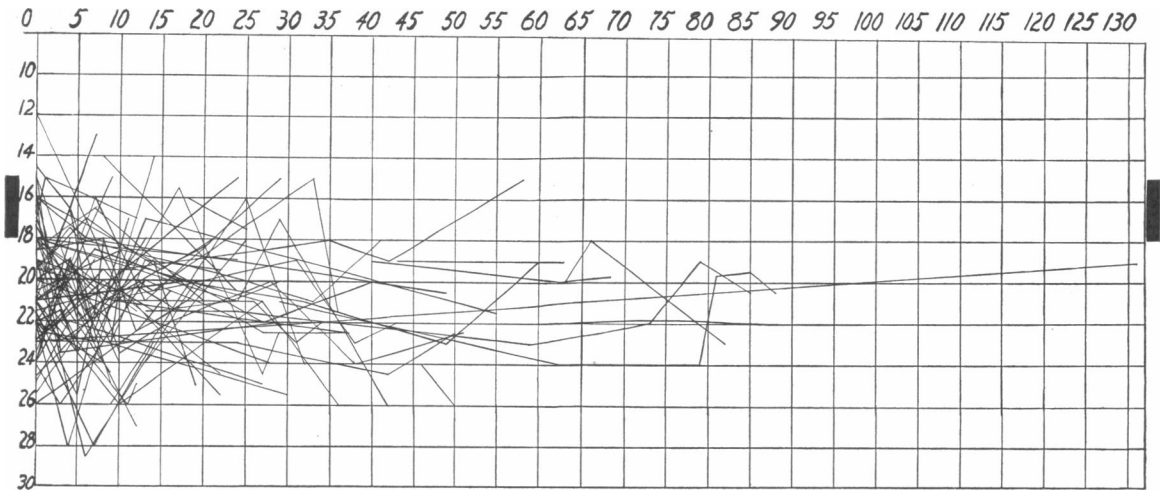


Chart 1.—(With abscissas reading 0-30) is as follows: Ordinates, time in months. Abscissas: Measurement in centimeters of the diameter of the right lobe of the liver in the midclavicular line (by percussion and palpation).

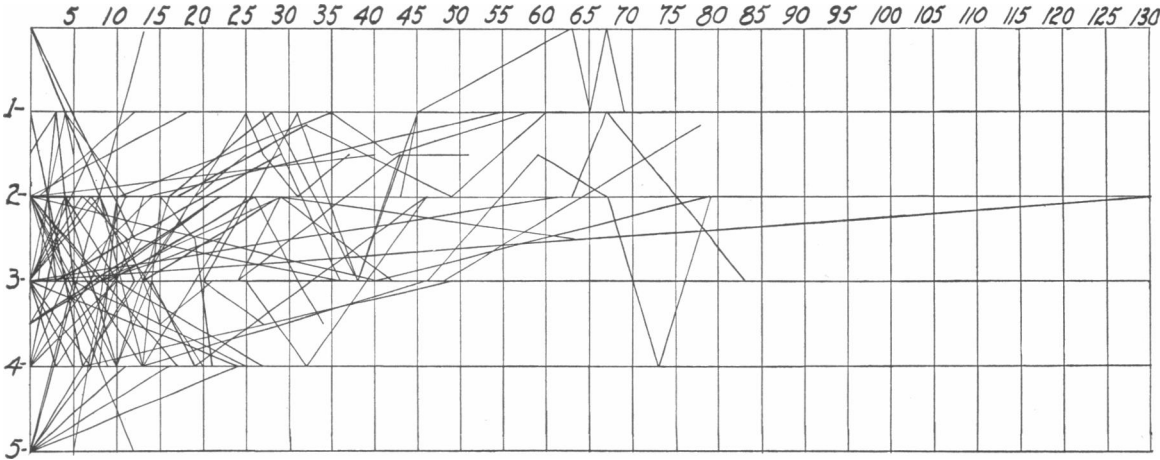


Chart 2.—(With abscissas 0-5) is as follows: Ordinates: Time in months. Abscissas: Measurement in finger-breadths of the right lobe of the liver downward from the costal margin in the midclavicular line (determined by percussion and palpation).

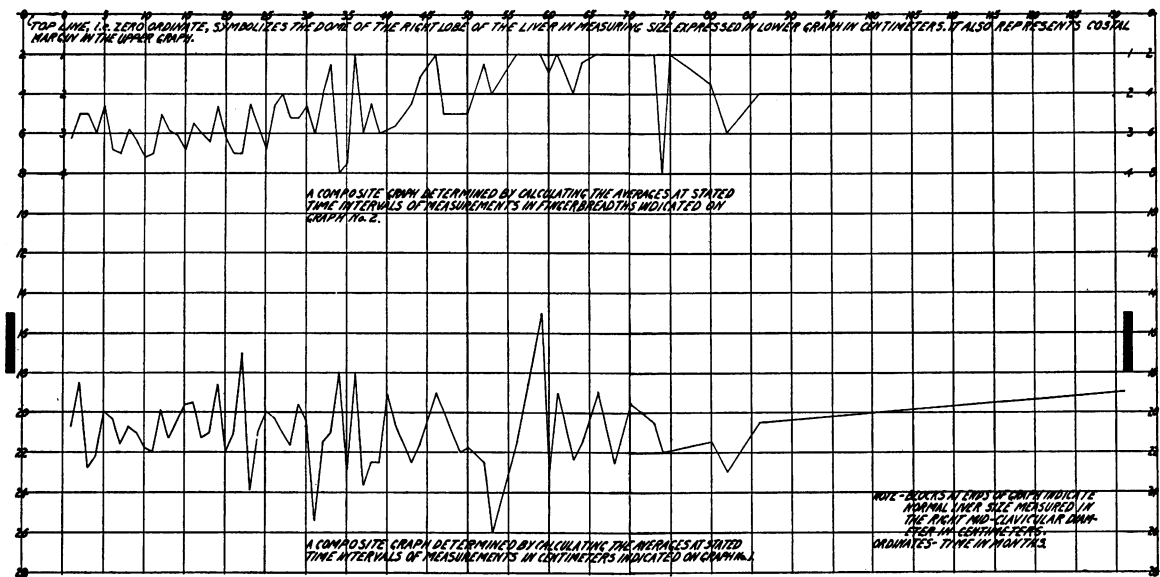


Chart 3.—Upper graph: A composite graph determined by calculating the averages at stated time intervals of measurements in finger breadths indicated on Graph No. 2. Lower graph: A composite graph determined by calculating the averages at stated time intervals of measurements in centimeters indicated on Graph No. 1.

The literature pertaining to measurement of the liver includes descriptions of fairly numerous "anatomical" measurements in the nonliving, roentgen methods including both screen and film in the living, and dye methods plus roentgen ray in the living.²

MEASUREMENT STANDARD ADOPTED

Because of the wide range in anatomical size of the liver in the human being, and out of experience, we selected in the present study the "normal" adult anatomical diameter of the right lobe of the liver in the right midclavicular line as ranging between 14.5 centimeters and 18 centimeters. This range is indicated on graphs, numbers 1 and 3, by the blocks on the right and left margins. It is believed that these graphs may serve to show at a glance the predominance of enlarged livers in cases of chronic human amebiasis and may suggest also a slight drift toward the "normal" limit under prolonged care. It would seem to be apparent that the problem of liver involvement in these cases is a continuous one.

MATERIAL FOR THE GRAPHS

The figures from which the lines on the graphs are derived represent actual data from our records. They represent a selection of eighty-four out of one group of six hundred seventy-four cases of amebiasis where the physique and temperament of the patient permitted relatively prolonged control, the average duration being two years and three months.

The total number of males in this study is thirty-nine (constituting 46.42 per cent of the patients. The total number of females is forty-five (53.57 per cent of the patients).

Seventy-seven of the eighty-four cases are represented on the fingerbreadth graph. There are two hundred fifty-one measurements in fingerbreadths, *i. e.*, two hundred fifty-one points on the fingerbreadth chart.

Seventy-nine cases are represented on the centimeter chart. There are two hundred sixty-nine measurements recorded on this chart.

The shortest period of time represented—that is, the shortest period of time elapsed between the first and final measurement—is two months. The longest period is one hundred thirty-one months. The average length of time for the eighty-four patients is 27.62 months, or two years and approximately three months.

TENTATIVE POSITIVE CONCLUSIONS

The tentative positive conclusions may be:

1. In chronic human amebiasis there is in this series an increase of activity in the liver area as measured grossly by liver size.

2. The feature of this activity is variability, the size of the liver changing during disease and treatment in a manner not uniform. The lack of uniformity reflects our ignorance of all the factors involved and their relationship. As an example, we have not correlated liver size and a very common arterial hypotension.

3. The graphs would seem to suggest a long-term drift toward smaller liver size under the influence of treatment.

4. The need for more accurate methods of delineating liver size than short-range roentgen-ray palpation and percussion is obvious.

Bank of America Building.

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 - (c) Tripoli, Carlo, Haam, Emmerich, and Lehman, E. B.: Roentgenographic Visualization of the Liver and Spleen in the Human—A Preliminary Report, Am. J. Roentgenol., Vol. 27, No. 2, p. 265 (Feb.), 1932.
 - (d) Bassler, Anthony: Diseases of the Intestines, Including the Liver, Gall-Bladder, Pancreas, and Lower Alimentary Tract. F. A. Davis, Philadelphia, 1928, p. 18: "The transverse diameter of the liver may be given at from 22 to 24 centimeters (8½ to 9½ inches); the greatest vertical dimension or depth is about 16 centimeters (6¼ inches); the anteroposterior diameter, 12 to 18.5 centimeters (4¾ to 7¼ inches)."
 - (e) Stengel, Alfred, and Kern, R. A.: Diseases of the Liver and Gall-Bladder, Nelson's Loose-Leaf Living Medicine. Thomas Nelson & Sons, New York. Vol. 5, Chap. 25, p. 472 (Nov.), 1928: "According to Bamberger, the absolute vertical dullness in the axillary line is 12 centimeters in the adult male and 10.5 centimeters in the female; in the mammillary line the dullness is 11 centimeters in the male, and 9 centimeters in the female; in the parasternal line, 10 centimeters and 8 centimeters."
 - (f) Williams, J. F.: A Textbook of Anatomy and Physiology. W. B. Saunders, Philadelphia, 1924, p. 403: "The liver measures 15 to 17 centimeters (6 to 7 inches) from front to back and about 10 centimeters (4 inches) from above downward in the thickest part."
 - (g) Morris, Henry, and McMurrich, J. P.: Morris's Human Anatomy: A Complete and Systematic Treatise by English and American Authors. P. Blakiston's Son & Co., Philadelphia, 1907, p. 1117, on *The Liver*: "It measures from right to left, 17 to 25 centimeters; from before backward, 7.5 to 15 centimeters; and 15 to 17 centimeters from above downward in the thickest part of the right lobe."
 - (h) Cunningham, D. J.: Textbook of Anatomy, William Wood & Co., New York, 1902, p. 1060, on *Weight and Size of the Liver*: "The average size of the liver may be briefly expressed as follows: It measures in the transverse direction about 7 inches (17.5 centimeters); in the vertical, 6 to 7 inches (15 to 17.5 centimeters); and in the anteroposterior, on the right side where greatest, about 6 inches (15 centimeters).

DISCUSSION

ALFRED C. REED, M. D. (350 Post Street, San Francisco).—It has been known for years that the liver was easily infected in amebiasis and it has been suggested that every case of amebiasis included more or less transfer of amebas to the liver, accompanied by a greater or lesser degree of hepatitis. The importance of liver invasion is difficult to assess but of immediate consequence in therapy. Three points are involved: (1) It is desirable to forestall the development of hepatitis into hepatic abscess. (2) It is desirable to improve impaired liver function for the sake of the general health and resistance of the patient. (3) It is undesirable to use arsenicals, for instance, in treat-

ment if liver function is much impaired. It follows logically, then, that the functional and infective status of the liver, with reference to amebas, ought to be established in every case of amebiasis. The immediate practical question is how best to establish this hepatic status.

The author, in the paper under discussion, suggests external direct mensuration as a practical method. He, himself, notes the major objections to the method, chiefly in the great variation in normal size. It is my opinion that mensuration is of use, but is secondary in practical clinical value to functional tests; and that x-ray examination offers more accurate data as to size than does external mensuration. The data and conclusions in the paper are valuable and interesting, but must be considered in the light of the whole problem. It may well be that experimental methods will be necessary to reach a final working rule.

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JOHN V. BARROW, M. D. (1930 Wilshire Boulevard, Los Angeles).—This paper is timely because of the increasing interest in amebiasis. Several investigators report a moderately high percentage of infestation among the general public. In my own practice the infestation occurs more frequently because of reference and gastro-intestinal work.

The actual measurement of the liver by roentgen ray is very difficult. However, clinically the liver is often increased in size. I am sure this increase is not always due to either large or multiple abscesses. An influence on the liver not accounted for by abscess is that of amebic toxins. Whether the increased icterus index in these cases is a measure of the disturbed liver function has not yet been proved. The inability of the liver to get rid of the surplus bile pigment in the blood can rationally be considered disturbed liver function. In considering the toxicity of amebiasis we may well consider a phase of enlargement as in other chronic toxemias with the subsequent shrinkage, as is the terminal process in severe liver poisoning. The function most disturbed is probably the proteopexic retardation. Upon the gluco-protein combination depends the detoxication of such substances as the body of the ameba may well contain. The toxic protein radical may be taken care of wherever tissue goes into solution for body use. Wherever this physiologic process fails antigens become a burden to normal physiology. Allergic phenomena present themselves in these protozoan cases, as attested by the frequency of arthritis, neuritis, iritis, and disturbance in the blood tissues. Under the influence of treatment the liver becomes clinically better, as shown in Doctor Boyers' third conclusion.

The points made by the author are very helpful, clinically, to all physicians and surgeons. The admitted truth of his contentions must be left for the pathologist to confirm at autopsy. Where proper treatment is instigated in reasonable time the post-mortem findings become fewer and fewer.

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RAWSON J. PICKARD, M. D. (520 E Street, San Diego). The ameba of the chronic amebiasis seen in the temperate zone has been distinguished by Brumpt from the ameba of dysentery on the basis of its "nonpathogenicity." This point is in error. Boyers, Reed, Craig, Barrow, Ravaut, and others have proved that there is a definite symptom complex in infections with this ameba, although it rarely gives rise to dysentery or liver abscess. I submitted the argument that this very difference in disease produced was a support for Brumpt's separation of "E. dispar" as a distinct amebic race (1927).

Taken as a whole the symptoms of chronic amebiasis, although largely subjective, are specific and diagnostic. The author, in this paper, gives us a measurable objective proof of the disturbing effect of this infection on the digestive organs. Judging from the curves in Chart 3, at the fifteen or twenty-month period, a period that includes the majority of the observations, there is little change in the size of the liver during

treatment, but these same patients who keep returning for observation are notoriously those who improve under treatment but who continually relapse.

At a time when there is overexploitation of laboratory procedures, and especially of the roentgen ray, Doctor Boyers' sane and common-sense emphasis of careful physical examinations is of a practical value, as great as is the fact that in this series of patients with enlarged livers he has furnished an impressive objective proof of the damage caused by chronic amebic infection.

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DOCTOR BOYERS (Closing).—I wish to thank Doctors Reed, Barrow, and Pickard for their discussions. In reply to a personal letter from one of them, I am adding the following information:

From records of 850 cases of chronic human amebiasis, liver measurement (as described above) has been made once, or more than once, in 450 of these cases. Discussion and graphs representing measurement in fingerbreadths and centimeters in 84 cases constitute the text of our original article. Reference to the records of the remaining 366 cases reveals that in these cases 458 measurements in centimeters of the diameter of the right lobe of the liver, and 512 measurements in fingerbreadths of the projection of the right lobe below the costal margin have been made.

The following tables show the frequency of the various measurements and the percentage of those within normal limits and of those larger than normal:

Measurement of the Right Lobe of the Liver in the Right Midclavicular Line, Expressed in Centimeters

	No. of Measurements	Per Cent
14.5 cms. and less than 14.5 cms.....	29	6.33
15 cms. and 15.5 cms.....	22	4.80
16 cms. and 16.5 cms.....	27	5.90
17 cms. and 17.5 cms.....	42	9.17
18 cms. and 18.5 cms.....	46	10.04
19 cms. and 19.5 cms.....	51	11.14
20 cms. and 20.5 cms.....	66	14.41
21 cms. and 21.5 cms.....	55	12.01
22 cms. and 22.5 cms.....	52	11.35
23 cms. and 23.5 cms.....	30	6.55
24 cms. and 24.5 cms.....	19	4.15
25 cms. to 27.5 cms.....	19	4.15
Total measurements in centimeters.....	458	100.00

Measurement of the Lower Edge of the Right Lobe of the Liver in the Midclavicular Line, Expressed in Fingerbreadths

	No. of Measurements	Per Cent
At the costal margin or barely palpable....	60	11.72
1 fingerbreadth or 1.5 fingerbreadths below the costal margin.....	100	19.53
2 and 2.5 fingerbreadths below.....	115	22.46
3 and 3.5 fingerbreadths below.....	172	33.59
4 and 4.5 fingerbreadths below.....	54	10.55
5 and 6 fingerbreadths below.....	11	2.15
Total measurements in fingerbreadths.....	512	100.00

The cases in this study include both sexes, and both children and adults.

The number of cases given is exclusive, with very few exceptions, of those seen in the University of California Infirmary in the years 1919, 1920, 1921, 1922, and half of 1923. It is also exclusive, with a few exceptions, of patients with amebic infection seen in two years' service in the Alameda County Hospital at Fairmont. It is also exclusive of all cases, with one or two exceptions, seen in the Caribbean countries, and is exclusive of those seen in Liverpool and London. It does *not* include clinical and therapeutic positives.

Acknowledgment in these studies is due C. A. Kofoid, Ph. D., Sc. D., and Olive Swezy, Ph. D., of the University of California.